UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: REVISED OCCUPATIONAL AND RESIDENTIAL EXPOSURE ASSESSMENT FOR THE CAPTAN REREGISTRATION ELIGIBILITY DECISION (RED)

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Please find the OREB review of ....

DP Barcode: D222418, D226527

Pesticide Chemical Codes: 081301,

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PHED: version 1.1

This memorandum presents the revised Occupational and Residential exposure assessment for the Captan Reregistration Eligibility Decision (RED). The revision is based on new dermal absorption rates, a recalculated Q*, reduced application rates, and issues presented in the CAPTAN Task Force's rebuttal to the previous HED Draft of the Captan RED. OREB's response to the issues raised by the CAPTAN Task Force are provided in a separate memorandum "Review of the Registrant's Response to the Draft Occupational and Residential Exposure Chapter for the Captan Reregistration Eligibility Decision" from J. Evans, OREB to M. Metzger, RCAB, dated 9/4/96. This assessment is to be used in place of the March 17, 1997 assessment reflecting the use of the Q* of 1.21×10^{-3}.

(RED SECTION III - TOXICITY, EXPOSURE, AND RISK)

(EXPOSURE)

Occupational and Residential

An Occupational and/or residential exposure assessment is required for an active ingredient if (1) certain toxicological criteria are triggered and (2) there is potential exposure to handlers (mixers, loaders, applicators, etc.) during use or to persons entering treated sites after application is complete. Captan meets these two criteria.

Use Summary

Use Patterns

Captan is a non-systemic fungicide used as a protectant against fungal diseases on a wide variety of plant materials. Captan is also used as a fungicide/preservative in manufactured products such as paints and adhesives. On August 18, 1980, the Agency initiated a Special Review of captan based on its classification as a B_2, probable human carcinogen. As a result of the special review, it was determined that the non-food uses would be retained while some food uses would be canceled. A Task Force, representing the then major manufacturers of captan, was formed to provide the necessary toxicology, residue, and worker exposure data required to support the remaining uses. The Task Force currently consists of Zeneca Inc. (formerly ICI Americas Inc.) and Makhteshim-Agan (America), Inc. The Task Force intends to support the reregistration of captan for the following uses[1]:

Terrestrial Food Uses:

Seed/Seed Piece Treatment for crops such as alfalfa, cereal grains, cotton, soybeans, corn, potatoes, and vegetables.

Spray Applications to almonds, apples, apricots, blueberries, cherries, grapes, pears, plums, strawberries, caneberries (IR-4), nectarines, and peaches.

Post-harvest fruit dips to control storage diseases for apples, pears, and cherries.

Terrestrial Non-Food Uses:

Spray Applications to azaleas, begonias, camellias, carnations, chrysanthemums, conifers, dichondra, gladiolus, grasses (lawns and lawn seedbeds), ornamental flowering plants, roses.

Greenhouse soil treatments.

Non-Agricultural/Industrial Uses:

In-plant additives for paints, plastics, rubber, adhesives, cosmetics.

Use in pet powders and shampoos.

Occupational-Use and Homeowner-Use Products

There are several products containing captan that are intended for use by homeowners. These include wettable powder/dust formulations that may be applied by the homeowner to vegetable gardens, fruit trees, ornamental trees and shrubs, and turfgrass. Captan is also formulated into paints, adhesives, and vinyl products that may also be used in and around residences.

Summary of Toxicity Concerns Impacting Occupational and Residential Exposures

Acute Toxicity

Captan technical is classified as Toxicity Category IV for acute oral toxicity and primary dermal irritation; Toxicity Category III for acute dermal toxicity and acute inhalation toxicity. Captan technical is classified as Toxicity Category I for primary eye irritation (irreversible corneal opacities in unwashed eyes). Captan is also a moderate skin sensitizer.

Other Endpoints of Concern

In the Toxicology Endpoint Selection (TES) Document for Captan dated 10/14/94, the Agency's toxicologists recommended that a risk assessment be conducted for short-term (1 to 7 days) exposure. The TES Committee selected the endpoint (NOEL of 10 mg/kg/day) for use in the exposure assessment, from a developmental toxicity study using rabbits. The NOEL is based upon increased post-implantation loss, reduced mean fetal weight, and increased skeletal defects in fetuses.

Captan is a B2, "probable human carcinogen" based on increased incidence of renal cortical/tubular cell neoplasms in male, Charles River, CD rats and increased incidence of uterine sarcomas in Wistar rats. Other evidence includes increased incidence of intestinal neoplasms in B6C3F1 mice, in ICR-derived CD-mice, and in Charles River CD-1 mice. The Q* is 1.21×1^{-3} $(mg/kg/day)^{-1}$. The Q* was 1.05×10^{-3} in the previous draft.

To assess dermal exposure, a dermal absorption rate of 0.4%/hour was selected. The selected rate was presented in a memorandum from Dr. Zendzian, Senior Pharmacologist, to John Redden, RCAB, dated 6/20/96. Dermal absorption will be calculated as follows:

For example, the first hour-0.4% x 10mg available for absorption = 0.04 mg
The second hour 10 mg minus 0.04 mg from first hour plus the second hourly deposit. This will continue throughout the eight hour period. For tasks taking less that 8 hours, the dose will be assumed to absorbed in a similar manner only without the additional exposure.

FQPA Captan is similar to the fungicide folpet (Phaltan).

Incidence Reports

Captan is in Toxicity Category I for primary eye irritation and is a moderate skin sensitizer. According to the information provided in incident reports reviewed by the California Pesticide Illness Surveillance Program between 1982 and 1990, there were 14 eye/skin incidents reported for reentry workers, 14 eye/skin incidents reported for mixer/loader/applicators, and 10 eye/skin incidents reported for other activities such as dipping flowers, preparing root and bulb dips, moving recently treated seed with forklifts, and exposure to spray drift.

There are many uncertainties associated with eye/skin incidence reporting and the Agency's ability to mitigate these adverse effects. Some of the uncertainties include:

- The majority of incident reports are associated with pesticide applications that are applied as tank mixes. These tank mixes often involve other active ingredients which may also be irritants or sensitizers;

- Symptoms such as conjunctivitis and irritation can be caused by soil, sweat, and foreign objects such as plant material irrespective of any pesticide used;

- Eye incidents are typically under-reported for reasons such as fear of employer reprisal, migrant workers not wanting to attract attention to themselves, and the cost of medical treatment;

- Few states require incident reporting. Captan is used more frequently in areas outside California (one of the few states requiring physicians to report pesticide incidents) where conditions, such as high humidity favor the plant diseases controlled by captan.

Handler Exposures and Assumptions

Terrestrial Food Uses: Seed/Seed Piece Treatments for crops such as alfalfa, cereal grains, cotton, soybeans, corn, potatoes, and vegetables.

The Agency is addressing two occupational exposure scenarios associated with the seed/seed piece treatment use:

1) exposure while operating commercial or smaller on-farm bulk seed treatment equipment;

2) exposure while adding captan to seed during planting activities.

bulk seed treatment:

To address occupational exposures while operating commercial or smaller on-farm bulk seed treatment equipment, the Agency has considered the 1980 study "Potential Exposure of Workers During Seed Potato Treatment with Captan", E.R. Stevens and J.E. Davis. In that study, the investigators monitored handlers pouring captan into seed hoppers of potato seed piece dusting machines, handlers cutting and sorting the treated potato seed pieces, operators of potato seed piece planters, and observers involved in the planting operations. The study was conducted on potato farms located in the Columbia Basin Irrigation Project during the potato planting season.

Typically, potato seed pieces are treated at planting time. In the study, dermal exposure monitoring was limited to the hands, face, and neck, based on the assumption that handlers normally wear long-sleeved shirts or jackets and long pants, during cool weather in the early spring when these operations are conducted. Hand exposure was not monitored for the handlers cutting and sorting the potato seed pieces, because they wore rubber gloves. However, hand exposure was monitored for the handlers filling the seed hoppers with captan because these handlers wore canvas-backed leather gloves. Inhalation exposure monitoring was also conducted because it was observed that workers did not routinely wear dust respirators during these operations. The potential hourly exposure rates are presented in Table 1.

Table 1. Potential Exposure* of Workers to Captan During Potato Seed Piece Treatment and Potato Planting, at the rate of 0.075 lb ai/100 pounds of potato seed pieces.

Activity (number of replicates)	Average Dermal Exposure excluding hands (mg/hr)	Average Hand Exposure (mg/hr)	Average Dermal Exposure* (mg/hr)	Average Inhalation Exposure (mg/hr)
Filling the hopper (15)	4.12	3.56 (with leather gloves)	7.68	0.82
Cutting and sorting treated seed pieces (30)	0.55	Not collected, (rubber gloves worn)	0.55	0.04
Observer riding on rear of planter (5)	0.31	0.015	0.33	0.03
Planting, enclosed cab (5)	0.34	0.033	0.37	0.03

* Does not consider dermal absorption. Estimates for absorbed daily dose are presented in Table 2.

In the PD 2/3 it was estimated that exposure, as a result of these operations, occurs 5 days per year for typical farms, such as those located in Maine, and 15 days exposure per year for larger farms, such as those located in Idaho.

Table 2. Margins of Exposure and Cancer Risk for Handlers using Captan During Potato Seed Piece Treating and Planting Captan

Activity (number of replicates)	Daily Systemic Dose (mg/day)	DSD Adjusted for 60kg body wt. (mg/kg/ day)	Margin of Exposure	DSD Adjusted for 70 kg body wt. (mg/kg/ day)	Cancer Risk (X 10)
Filling the hopper (15)	7.07	0.12	83 (not including dust/mist resp.)	0.1	8.2^{-7} - 2.5^{-6}
Cutting and sorting (30)	1.62	0.0066	1515 (with gloves)	0.0057	4.7^{-8} - 1.4^{-7}
Observer riding on rear of planter (5)	0.287	0.0048	2083	0.0041	3.3^{-8} - 1.0^{-7}
Planting, enclosed cab (5)	0.293	0.0049	2041	0.0042	3.4^{-8}- 1.0^{-7}

seed treatment, planter box

There are no activity-specific data to address the use of captan as a planter-box seed treatment, at planting time. To address this scenario, the mixer/loader data for wettable powder formulations available in PHED will be used. In the PD 2/3, it was determined that soybeans were the most likely crop to require planter-box seed treatment, since most other crop seeds are normally acquired pretreated. The activity consists of adding small amounts of captan to soybean seed after it has been loaded into the soybean planter seed hoppers. Captan is either mixed into the top few inches of seed to help disperse the captan dust or left alone to be mixed by normal shaking of the hopper as it moves through the field. The assumptions used for this scenario include the treatment of enough soybean seed to plant 60 acres per day (six-row planter with 30 inch rows planted at 4 mph), and a treatment rate of

0.066 lb ai/bushel at 1.13 bushels planted per acre. Individuals are estimated to use captan 5 days per year as planter box treatment.

airblast and groundboom applications

Spray applications to almonds, apples, apricots, blueberries, cherries, grapes, pears, plums, strawberries, caneberries (IR-4), nectarines, peaches.

Surrogate exposure data to address handler exposure for these applications are available in the Agency's Pesticide Handlers Exposure Database (PHED). Mixer/loader exposure estimates are calculated separately from the applicator estimates to address the differences between handling the wettable powder and liquid/flowable formulations and differing exposures between mixing/loading and application activities. The dilution rates for aerial, groundboom, and airblast applications are assumed to be 20, 100, and 400 gallons per acre respectively. The assumptions regarding acres treated per day are presented in Table 3, Summary Exposure Values for Captan (mg/day). Handlers are assumed to use captan 7 days per year for strawberries and 3 days per year for the remaining fruit crops.

Almonds and strawberries were considered the crops most likely to be treated by aircraft based on strawberries being a row crop and almonds, which are grown in concentrated areas, occasionally need emergency treatments during periods of extensive rain when ground equipment cannot be used. Although almonds require a higher rate than strawberries, handler exposure for treating strawberries was used in the exposure assessment instead since it is assumed more acres per day are treated (100 vs 300 acres per day aircraft). Strawberries are also likely to be treated by groundboom equipment and orchard and trellis crops are assumed to be treated by airblast equipment.

Surrogate data are available to distinguish handler exposure for individuals treating dwarf fruit trees and trellis crops, such as grapes and brambles, from those individuals treating traditionally cultivated orchards. These separate scenarios are presented in Table 3. Scenarios addressing home gardener exposure are discussed under the ornamental uses.

post-harvest dip applications for apples, cherries, and pears

There are no activity-specific data to address the use of captan as a post-harvest dip treatment for apples, cherries, and pears to control spoilage during storage and transit. The main activity is the mixing/loading of captan into the dip/drench tank. Most of the application itself is mechanized and involves relatively low exposure potential. These activities include overseeing the apples being conveyed in and out of the dip/drench area, and operating forklifts to convey field boxes or bulk bins of fruit for dipping or storage. Dipping the fruit by hand would involve relatively high exposure potential. However, EPA has no data to assess the exposures and risks from hand dipping. The only data available in PHED to address this scenario are those for the mixer/loader handling a wettable powder. This activity is assumed to result in the highest exposure. In the PD 2/3, it was determined that a

mixer/loader would prepare four batches per day for a period of 6 weeks (in West Virginia) to 32 weeks (in Washington state). The dip tank sizes are assumed to range from 1000 to 3000 gallons.

Terrestrial Non-Food Uses:

Spray applications to azaleas, begonias, camellias, carnations, chrysanthemums, conifers, dichondra, gladiolus, grasses (lawns and lawn seedbeds), ornamental flowering plants, roses.

groundboom applications to field grown ornamentals

Data are available in PHED to assess mixer/loader and groundboom applicator exposure for treatment of field grown ornamentals such as azaleas and carnations. However, the Agency believes exposure from these treatments is lower than would be expected for the strawberry exposure scenario presented in Table 3. This is based on the likelihood of smaller acreages of field-grown ornamentals being treated in one day and those handlers being exposed to less amounts of active ingredient per day. Therefore, the exposure and risk assessment for groundboom applications to strawberries is used as a reasonable worse-case surrogate for applications to field-grown ornamentals.

applications to greenhouse-grown ornamentals using hand-held and groundboom equipment

For applications to greenhouse grown ornamentals such as carnations and chrysanthemums, two appropriate application scenarios were available in the database. These are applications using a high-pressure portable handwand, and the backpack/knapsack sprayer. In the PD 2/3, it was assumed that mixer/loaders spent 0.25 hr per day 26 days per year and applicators spent 0.5 hr per day 26 days per year handling captan. In some larger greenhouse operations, groundboom sprayers are utilized for early sprays. These applications are assumed to result in lower exposures than would be expected for groundboom applications to strawberries based on the likelihood of smaller acreages being treated in one day. Therefore, the exposure and risk assessment for groundboom applications to strawberries is used as a reasonable worse-case surrogate for groundboom applications to greenhouse ornamentals. Consequently, an exposure assessment for greenhouse ornamentals will be conducted only for the hand-held equipment scenarios.

Typical use directions for ornamentals include dilution rates with directions to apply the dilutions to the point of run-off. Because dosages are expressed as amount of active ingredient (ai) per 100 gallons of water it is difficult to determine the amount of ai applied to a specific area. In a greenhouse study conducted in the Netherlands (Brouwer et. al.)[2], it was reported that typical high pressure sprays to mature crops require 300 to 350 liters (approximately 75 gallons) of water per 1,000 sq. meters (approximately 0.25 acre). In that study, applicators required approximately 50 minutes to spray 1,000 sq. meters. Therefore,

for the high pressure exposure scenario, OREB will assume one hour per day for mixing/loading and applying the pesticide 26 days per year. Although it is unlikely that a backpack sprayer could deliver 100 gallons per hour, OREB will assume one pound ai handled per day for 26 days per year.

greenhouse soil treatments

These treatments are similar to the foliar treatments discussed above. The only exception being that the application is directed to the soil around the plants rather than the foliage. Therefore, the exposure and risk assessment for applications to greenhouse ornamentals using hand-held equipment is used as a reasonable worse-case surrogate for greenhouse soil treatments.

residential applications made by home gardeners

Surrogate data are available in PHED to address exposure scenarios for home gardeners. These scenarios are for mixing/loading and applying captan using a garden hose-end sprayer and a one-to-two gallon tank sprayer with a handwand. The Agency strongly recommends the use of baseline attire (i.e., long-sleeve shirt, long pants, shoes, and socks) by any applicator. However, as an added safety measure, the Agency will assume that such attire is not routinely worn by home applicators for this risk assessment. The assessment is conducted using total deposition -- no protection factors are used to account for long-sleeves or long pants. In the PD 2/3, it was assumed that homeowners use 0.8 ounces of captan in 5 gallons of diluted spray per day for 4 days per year. In California, it was assumed that captan may be applied up to 18 times per year[3]. Therefore, OREB will assume the higher frequency (18 times per year) to account for usage in areas of the United States having mild climates. The Agency will also assume 50 years of use for lifetime exposure estimates.

residential applications to lawns

There are limited surrogate data available in PHED to address this scenario for the homeowner and profession lawn care personnel while mixer/loading and applying captan to both turfgrass and dichondra. For the homeowner, the Agency has assumed a treatment area of 5,000 square feet. The frequency of use is assumed to be 2 times a year over a 50 year lifetime. Like the home garden applications, the Agency will assume that the homeowner is not routinely wearing long-sleeves and long pants while mixing/loading and applying captan. For the professional lawn care operator (LCO), the Agency assumed that two acres per day would be treated up to 10 times per year

applications to golf courses

There are surrogate data available to address the application of captan to golf courses. For this use, the Agency has assumed the use of groundboom equipment, and that a typical

golf course consists of 40 acres of fairways. The golf course is assumed to be treated 10 times a year.

Non-Agricultural/Industrial Uses:

in-plant additives for paints, plastics, vinyl, rubber, adhesives, and cosmetics

Data are available in PHED to address worker exposure to captan resulting from its use as a preservative/fungicide for paints, vinyl, plastics, rubber, adhesives, and cosmetics. Mixer/loader data available in PHED was used to address workers adding captan during the manufacturing of these industrial products since these uses appear to be similar to those of an agricultural mixer/loader. Captan is weighed then added to the various products which are typically made in batches (e.g., paint and wallpaper paste). Although plastic and vinyl are relatively inert, captan is used to control molds attacking plasticizers (such as ethylene glycol), which are added to enhance the properties of plastics such as toughness and flexibility.

According to information available at the time of the PD 2/3, captan's use as an additive to industrial products was very limited. It was anticipated that an even lower market share could be expected in the future. Exposure scenarios addressing the addition of captan into specialty paints having pesticidal claims and into adhesives to promote longer shelf-life were selected as representative scenarios for the industrial uses.

For captan formulated into paint products, a rate of 12 pounds active ingredient per 100 gallons of paint is used, with a total of 36 pounds active ingredient added per day. For captan to be used as preservative to be incorporated into wallpaper paste, 7.9 pounds active ingredient are used per day. Although the use of captan in these products is reportedly limited, the assessment will assume 250 days of exposure per year.

Commercial painter and homeowner painter exposures, with respect to application of paints containing captan, were also estimated. The commercial and homeowner exposure assessments were conducted using PHED. Homeowners were assumed to use the paints one day a year for 50 years. The painter assessment is used as a reasonable worse-case surrogate for other secondary handler exposures to products such as wallpaper paste, adhesives, etc.

Use in pet powders, hand soaps, and cosmetics.

Captan is formulated into pet powders, hand soaps, and cosmetics. Based on information provided in the PD 2/3, it appears that captan is used on a very limited basis. Thus a handler exposure assessment in the industrial/manufacturing settings is not being conducted based on the assumption that the use of captan as an additive to paints and adhesives represents a greater exposure. There is also a secondary handler exposure potential for persons using these captan-containing products. These include exposure to persons using cosmetic products, hand soaps, and pet powders and shampoos.

Post Application Exposures and Assumptions

EPA has determined that there is a post application exposure potential for persons entering certain treated sites after the application is completed. Post-application exposure is particularly likely following foliar applications to agricultural crops, ornamentals (field and greenhouse grown), golf-course and sod farm turfgrass, and residential lawns and gardens. Post-application exposure is likely to be less significant in industrial and manufacturing settings and following the use of pet products.

To support the reregistration of captan, the CAPTAN Task Force has submitted four worker, post-application/reentry exposure studies. Each study consists of two MRID numbers representing dislodgeable residues (Guidelines 132-1a,b) which were conducted concurrently with worker (harvesting) exposure monitoring (Guidelines 133-3,4). One of those studies was for reentry exposure following applications of captan to tomatoes. Since the Captan Task Force is not supporting tomatoes, this study has not been included in the exposure assessment. The three remaining studies are adequate to support the agricultural uses of captan.

Table 3. Summary Exposure Values for Captan (mg/day) Using the Pesticide Handlers Exposure Database (Ver 1.1)

Exposure Scenario (scenario number)	Unit Exposure - Dermal[a] (mg/lb ai)	Unit Exposure - Inhalation[b] (ug/lb ai)	Application Rate[c] (lb ai/cycle)	Daily Amt.[d] Treated	Daily Dermal Dose[e] (mg/day)	Daily Inhalation Dose[f] (mg/day)	Combined Dermal and Inhalation Dose (mg/day)
Mixer/Loader Exposure							
Wettable Powders (Aerial Application) - strawberries (I)	0.167	43.4	3 lb ai/A, 7x/season	350 acres	3.12	45.57 (9.1 with dust/mist respirator)	48.69 (12.2 with dust/mist respirator)
Wettable Powders (Airblast Application) - apples, apricots, cherries, grapes, peach, nectarines, blueberries (I)	0.167	43.4	2-4 lb ai/A, 3x/season	40 acres	0.24 - 0.48	3.5 - 7 (0.69 - 1.39 with dust/mist respirator)	3.74 - 7.48 (0.93 - 1.87 with dust/mist respirator)
Wettable Powders (Groundboom Application) - strawberries and ornamentals (I)	0.167	43.4	3 lb ai/A, 7x/season	20 acres	0.178	2.6 (with dust/ mist respirator)	2.778 (with dust/mist respirator)
Wettable Powders (High Pressure Spray) - greenhouses (I)	0.167	43.4	1 lb ai/100 gallons 26x/year	100 gallons	0.0046	0.009 (with dust/mist respirator)	0.0136 (with dust/mist respirator)
Wettable Powders (Groundboom Application) - golf course (I)	0.167	43.4	4.4 lb ai/A, 10x/season	40 acres	0.525	7.64 (1.53 with dust/mist respirator)	7.758 (2.055 with a dust/mist respirator)
Wettable Powders (Industrial use as a paint preservative) (I)	0.167	43.4	31.7 lb ai/day	--	0.145	1.375 (with dust/mist respirator)	1.52 (with dust/ mist respirator)

Wettable Powders (Industrial use as a preservative for adhesives) (I)	0.167	43.4	7.9	--	0.036	0.342 (with dust/mist respirator)	0.378 (with dust/mist respirator)
Wettable Powders (hopper box, seed treatment - soybeans) (I)	0.167	43.4	0.033 lb ai/bushel, 1.13 bushels per acre	100 acres	0.011	0.162 (with dust/mist respirator)	0.173 (with dust/mist respirator)
Wettable Powders (fruit dips) (I)	0.167	43.4	1.25 lb ai/100 gallons	3000 gallon tank	0.172	1.62 (with dust/ mist respirator)	1.8 (with dust/ mist respirator)
Liquids/Flowable (Aerial Application-strawberries) (II)	0.043	0.24	3 lb ai/A, 7x/season	350 acres	0.8	0.25	1.05
Liquids/Flowables (Airblast Application) - apples, apricots, cherries, grapes, peach, nectarines, blueberries (II)	0.043	0.24	2-4 lb ai/A, 3x/season	40 acres	0.062 - 0.123	0.019 - 0.038	0.081 - 0.164
Liquids/Flowables (Groundboom Application - strawberries (II)	0.043	0.24	3 lb ai/A, 7x/season	20 acres	0.045	0.0144	0.059
Applicator and Flagger Exposure							
Flagger (III)	0.01	0.36	3 lb ai/A, 7x/season	350 acres	0.19	0.378	0.56
Aerial Application - strawberries (IV)	0.005	0.068	3 lb ai/A, 7x/season	350 acres	0.093	0.07	0.163
Airblast Application - grapes, blueberries, brambles, dwarf stock (V)	0.917	1.71	2-4 lb ai/A, 3x/season	20 acres	0.65 - 1.31	0.047 - 0.094	0.697 - 1.40
Airblast Application - Standard Orchards - apples, apricots, cherries, peach, nectarines (VI)	0.244	5.68	2-4 lb ai/A, 3x/season	20 acres*	0.174 - 0.347	0.23 - 0.45	0.404 - 0.797
Groundboom Application - strawberries and ornamentals (VII)	0.015	0.47	3 lb ai/A, 7x/season	20 acres	0.016	0.044	0.06

Groundboom Application - Golf Course (VII)	0.015	0.47	4.4 lb ai/A, 10x/season	40 acres	0.049	0.13	0.179
Paint Brush (VIII)	182	0.57	5 gallons (0.15 lb ai)	5 gallons	0.48	not significant	0.48
Paint-Airless Sprayer (IX)	38.4	830	3 lb ai/100 gallons	200 gal/day	4.09	4.98 /1 with a dust/mist respirator)	9.07 (5.09 with a dust/mist respirator)
High Pressure Spray (X)	0.69	90.6	1 lb ai/100 gal, 26x/season	100 gal/0.25 acre	0.021	0.091	0.112
Mixer/Loader/Applicator							
Low Pressure Handwand Using a Wettable Powder (XI)	8.6	1063	0.8 oz/day (0.05 lb)	18x/yr	0.012	0.053	0.065
Low Pressure Handwand Using a Liquid/Flowable (XII)	0.43	30.2	0.8 oz/day (0.05 lb)	18x/yr	0.042	1.51	1.55
Backpack/Knapsack (XIII)	2.5	30.2	1 lb ai/100 gal/0.25 acre	0.25 - 1 acre	0.069 - 0.276	0.03 - 0.12	0.1 - 0.4
Garden Hose End-Sprayer - Dichondra (homeowner) (XIV)	33.6	9.5	1 lb ai/100 gal, 1 gal/10 sq. ft, 2x/yr	5,000 sq. ft	0.463	0.005	0.468
Hose End-Sprayer (commercial lawn care operator)- (XV)	3.7	9.5	1 lb ai/100 gal, 1 gal/10 sq. ft	2 acres	5.7	0.83	6.527

[a] Dermal unit exposures are reported as the best fit mean to simulate workers wearing long pants, long-sleeved shirts, and chemical resistant gloves, unless noted. The best fit mean is the composite total dermal exposure based on using the geometric mean for lognormal distributed data, arithmetic mean for normal distributed data, and the median for all other distribution types.

[b] Inhalation exposure values are reported as geometric means (lognormal distributions), unless otherwise noted.

[c] Luis Report dated 8/26/91, Captan, Task Force Memorandum dated 5/11/94, PD 2/3 dated 6/85.

[d] Values represent the typical area or the typical volume of spray solution which is assumed to be used in a single day to complete treatments for each exposure scenario of concern.

[e] Daily Dermal Dose (mg/day) = Exposure (mg/lb ai) * Appl. Rate (lb ai) * Amt.treated * dermal absorption See the discussion regarding dermal absorption under Other Endpoints of Concern

Daily Inhalation Dose (mg/day) = Exposure (mg/lb ai) * Appl. Rate (lb ai/cycle) * Amt. Treated * inhalation absorption (assumes 100%)

(For mixer/loaders of wettable powder formulations, an 80% protection factor was included to account for use of dust/mist respirators.

Table 4. Exposure Scenario Descriptions for Captan

Exposure Scenario	Data Source	Clothing Scenario[a]	Equipment	Comments[b]
Mixer/Loader Exposure				
Wettable Powders (I)	PHED	Long Pants, Long-Sleeved Shirt, Gloves	Open Mixing	Acceptable dermal grades; Inhalation all grades; Dermal = 22 to 45 replicates; Inhalation = 44 replicates
Liquids/Flowables (II)	PHED	Long Pants, Long-Sleeved Shirt, Gloves	Open Mixing	Acceptable grades; Dermal = 25 - 121 replicates; Inhalation = 85 replicates
Applicator Exposure				
Flagger (liquid) (III)	PHED	Long Pants, Long-Sleeved Shirt, No Gloves	Flagging for aerial applications of liquids	Acceptable grades; Dermal = 18 to 28 replicates; Inhalation = 28
Aerial Application (IV)	PHED	Long Pants, Long-Sleeved Shirt, No Gloves	Fixed wing, closed cab	Acceptable grades; Dermal = 24 to 48 replicates; Inhalation = 23 replicates
Airblast Application - grapes, blueberries, brambles, dwarf stock (V)	PHED	Long Pants, Long-sleeved Shirt, No Gloves	Open cab	Acceptable grades; Dermal, except hands = 18-20 replicates (note only 4 hand replicates); Inhalation = 22 replicates
Airblast Application - Standard Orchards - apples, apricots, cherries, peach, pear, nectarine (VI)	PHED	Long Pants, Long-sleeved Shirt, No Gloves	Open cab	Acceptable grades; Dermal = 23 to 49 replicates; Inhalation = 25

Groundboom Application (VII)	PHED	Long Pants, Long-Sleeved Shirt, No Gloves	Open cab	Grades A, B; Dermal = 23 to 33 replicates; Inhalation = 22 replicates
Paintbrush (VIII)	PHED	Long Pants, Long-Sleeved Shirt, No Gloves	Brush	Dermal grades B, C; Inhalation grade C; Dermal = 15 replicates; Inhalation = 15 replicates Data set consists of one study
Paint-Airless Sprayer (IX)	PHED	Long Pants, Long-Sleeved Shirt, No Gloves	High Pressure Airless Siphon Sprayer	Dermal grades B, C; Inhalation grade C; Dermal = 15 replicates; Inhalation = 15 replicates Data set consists of one study
High Pressure Sprayer (X)	PHED	Long Pants, Long-Sleeved Shirt, Gloves	High Pressure Portable Hand Wand on Wheels	Acceptable grades B and C; Dermal = 9 replicates; Inhalation = 9 replicates
Mixer/Loader/Applicator				
Low Pressure Handwand Using a Wettable Powder (XI)	PHED	Long Pants, Long-Sleeved Shirt, Gloves	2 to 3 gallon low pressure single wand	Acceptable grades; Dermal = 15 to 16 replicates; Inhalation = 16 replicates
Low Pressure Handwand Using a Liquid/Flowable (XII)	PHED	Long Pants, Long-Sleeved Shirt, Gloves	2 to 3 gallon low pressure single wand	Acceptable grades; Dermal = 9 to 80 replicates; Inhalation = 80 replicates
Backpack/Knapsack (XIII)	PHED	Long Pants, Long-Sleeved Shirt, Gloves	2 gallon knapsack	Acceptable grades (except for hand exposure); Dermal = 9 to 11 replicates; Inhalation = 11 replicates
Garden Hose End-Sprayer (XIV)	PHED	Total Deposition	Garden hose	All grades; Dermal = 8 replicates Inhalation = 8 replicates

Hose End-Sprayer (commercial lawn care operator) (XV)	PHED	Total Deposition - recalculated using 85% reduction for exposure to forearms, upper arms, chest back, thighs, lower legs and 90% reduction for gloves.	Garden Hose	All grades: Dermal = 8 replicates Inhalation = 8 replicates

[a] Clothing scenario represents actual monitored exposure data unless specified.

[b] "Acceptable grades," as defined by OREB SOP for meeting Subdivision U Guidelines, are grades A and B for dermal and inhalation, and grade C for hand rinse method.

Table 5. ACUTE RISK ESTIMATES FOR MIXER/LOADER EXPOSURE

Mixer/Loader Scenario From the PHED Surrogate Table 3	Daily Systemic Dose (mg/day)	DSD mg/kg/day Adjusted for Body Weight (60 kg)	Margin Of Exposure (MOE)
Wettable Powders (Aerial Application - strawberries (I)	12.2 (with a dust/mist respirator)	0.2	50
Wettable Powders (Airblast Application) - apples, apricots, cherries, grapes, peach, nectarines, blueberries (I)	0.93 - 1.87 (with a dust/mist respirator)	0.016-0.031	625 - 323
Wettable Powders (Groundboom Application) - strawberries (I)	0.7 (with a dust/mist respirator)	0.012	833
Wettable Powders (High Pressure Spray) - greenhouses (I)	0.005 (with a dust/mist respirator)	0.00008	125000
Wettable Powders (Groundboom Application) golf courses (I)	2.06 (with a dust/mist respirator)	0.034	294
Wettable Powders (Industrial use as a Paint Preservative) (I)	0.42 (with a dust/mist respirator)	0.007	1429
Wettable Powders (Industrial use as a Preservative for Adhesives (I)	0.104 (with a dust/mist respirator)	0.002	5000
Wettable Powders (hopper box, seed treatment - soybeans (I)	0.049 (with a dust/mist respirator)	0.001	10000
Wettable Powders (Post-harvest Fruit Dips) (I)	0.49 (with a dust/mist respirator)	0.01	1000
Liquids/Flowable (Aerial Application) - strawberries (I)	0.8	0.018	556

Liquids/Flowable (Airblast Application) - apples, apricots, cherries, grapes, peach, nectarines, blueberries (II)	0.081 - 0.164	0.001 - 0.003	3333 - 10000
Liquids/Flowable (Groundboom Application - Strawberries	0.059	0.001	10,000

Table 6. ACUTE RISK ESTIMATES FOR APPLICATOR AND FLAGGER EXPOSURE

Applicator Scenario From the PHED Surrogate Table 3	**Daily Systemic Dose mg/day**	**DSD mg/kg/day** Adjusted for Body Weight (60 kg)	**Margin Of Exposure (MOE)**
Flagger (III)	0.56	0.009	1075
Aerial Application (IV)	0.163	0.003	3333
Airblast Application - grapes, blueberries, brambles, dwarf stock (V)	0.697 - 1.40	0.012 - 0.023	435 - 833
Airblast Application - Standard Orchard - apples, apricots, cherries, peach, nectarines (VI)	0.404 - 0.797	0.007 - 0.013	769 - 1429
Groundboom Application - strawberries (VII)	0.06	0.001	10000
Groundboom Application - Golf Courses (VII)	0.179	0.003	3333
Paint Brush (VIII)	0.48	0.008	1250
Paint-Airless Sprayer (IX)	5.09 (with a dust/mist respirator)	0.085	118
High Pressure Spray (X)	0.112	0.002	5000

Table 7. ACUTE RISK ESTIMATES FOR MIXER/LOADER/APPLICATOR EXPOSURE USING HAND-HELD EQUIPMENT

Mixer/Loader/Applicator Scenario From the PHED Surrogate Table 3	Daily Systemic Dose **mg/day**	**DSD mg/kg/day** Adjusted for Body Weight (60 kg)	Margin Of Exposure (MOE)
Low Pressure Handwand Using a Wettable Powder (XI)	0.065	0.001	10000
Low Pressure Handwand Using a Liquid Flowable (XII)	0.003	0.0001	100000
Backpack/Knapsack (XIII)	0.1 - 0.4	0.002 - 0.007	1429 - 5000
Garden Hose-end Sprayer (homeowner) (XIV)	0.468	0.008	1250
Hose-end Sprayer (commercial lawn care operator) (XV)	6.527	0.11	93

In general, the acute risks to handlers using captan are acceptable with the addition of personal protective equipment, such as chemical-resistant gloves and dust/mist respirators, as warranted. The notable exceptions are the handlers loading wettable powder formulations for seed-piece treatment (Table 2) and mixing/loading wettable powder formulations to support aerial application, (Table 5). In the first scenario (loading for seed-piece treatment), the risks should be adequately mitigated (MOE: 250) with the addition of a dust/mist respirator. In the second scenario (mixing/loading to support aerial application), risks should be adequately mitigated with the addition of a chemical-resistant apron, since data indicate that the preponderance of non-hand exposure to mixers/loaders is to the front torso. EPA has no data to specifically assess the exposure reduction to mixers/loaders afforded by a chemical-resistant apron. Also, OREB notes that for inhalation exposure, 100 percent absorption is assumed in this assessment. OREB believes inhalation absorption is likely to be in the range of 50 percent absorption, which would result in an MOE of 77. Before the addition of a chemical-resistant apron. Furthermore, the registrant contends the assumption of 350 acres as the maximum treatment per day for strawberries by aircraft too high. Based on these factors, the use of a chemical-resistant gloves and apron plus a dust/mist respirator should adequately mitigate any acute concerns for these handles.

The MOE for professional lawn care operators (LCO) using adjusted surrogate data yields an MOE slightly less than 100 (93). Because the data for that scenario are limited, OREB does not recommend adding additional PPE. The Captan Task Force members are also members of the Outdoor Residential Exposure Task Force. That task force is addressing LCO exposure with mixer/loader/applicator monitoring data collected during the 1996 growing season. This scenario will be revisited when those data are submitted. Also, since all handlers of wettable powder formulations are being required to wear a dust/mist respirator while mixing and loading, the risks to these mixer/loader/applicators will be less than are reflected in the risk assessment.

The Agency and the regulated community has not developed a model to assess or a method to quantify handler exposure to eye irritants. For handlers (mixer/loader/applicators and flaggers), protective eyewear has been a prudent measure to mitigate risk and is not overly burdensome.

Table 8. Cancer Risk for Mixer/loaders Using Captan

Mixer/Loader Scenario From the PHED Surrogate Table 3	**Daily Systemic Dose mg/day** From the PHED Surrogate Exposure Table 1	**DSD mg/kg/da** x 10 Adjusted for Body Weight (70 kg)	AADE x 10	LADE x 10	Risk x 10
Wettable Powders (Aerial Application - strawberries (I)	12.2 (with a dust/mist respirator)	1.72^{-1}	3.3^{3}	1.6^{-3}	1.9^{-6}
Wettable Powders (Airblast Application) - apples, apricots, cherries, grapes, peach, nectarines, blueberries (I)	0.93 - 1.87 (with a dust/mist respirator)	$1.3 - 2.7^{-2}$	1.1 - 2.1^{-4}	5.3^{-5} - 1.1^{-4}	6.4^{-8} - 1.3^{-7}
Wettable Powders (Groundboom Application) - Strawberries (I)	0.7 (with a dust/mist respirator)	1.0^{-2}	1.9^{-5}	9.6^{-6}	1.1^{-8}
Wettable Powders (High Pressure Spray) - greenhouses (I)	0.005 (with a dust/mist respirator)	7.1^{-5}	5.1^{-6}	2.5^{-6}	3.0^{-9}
Wettable Powders (Groundboom Application) golf courses (I)	2.06 (with a dust/mist respirator)	2.9^{-2}	8.1^{-4}	4.0^{-4}	4.8^{-7}
Wettable Powders (Industrial use as a Paint Preservative) (I)	0.42 (with a dust/mist respirator)	6.0^{-3}	4.1^{-3}	2.0^{-3}	2.4^{-6}
Wettable Powders (Industrial use as a Preservative for adhesives (I)	0.104 (with dust/mist respirator)	1.48^{-3}	1.0^{-3}	5.1^{-4}	6.2^{-7}
Wettable Powders (Hopper Box Seed Treatment) - soybeans (I)	0.049 (with a dust/mist respirator)	7.0^{-4}	9.6^{-6}	4.8^{-6}	5.0^{-9}

Wettable Powders (Post-harvest Fruit Dips) (f	0.49 (with a dust/mist respirator)	7.0^{-3}	8.1^{-4} - 4.3^{-3}	4.0^{-4} - 2.1^{-3}	4.8^{-7} - 2.5^{-6}
Liquids/ Flowable (Aerial Application - strawberries	0.8	1.14^{-2}	2.2^{-4}	1.1^{-4}	1.3^{-7}
Liquids/ Flowable (Airblast Application) - apples, apricots, cherries, grapes, peach, nectarines, blueberries (ll)	0.081 - 0.164	1.2^{-3} - 2.3^{-3}	9.5^{-6} - 1.9^{-5}	4.8^{-6} - 9.6^{-6}	5.0^{-9} - 1.1^{-8}
Liquids/ Flowable (Groundboom Application) - strawberries	0.059	8.4^{-4}	1.6^{-5}	8.2^{-6}	9.0^{-9}

Table 9. Cancer Risk for Flaggers and Applicators Using Captan

Applicator Flagger Scenario From the PHED Surrogate Table 3	**DSD mg/day** From the PHED Surrogate Exposure Table 3	**DSD mg/kg/da** x 10 Adjusted for Body Weight (70 kg)	AADE x 10	LADE x 10	Risk x 10
Flagger (III)	0.56	8.0^{-3}	1.5^{-4}	7.7^{-5}	9.2^{-8}
Aerial Application (IV)	0.163	2.3^{-3}	4.5^{-5}	2.2^{-5}	2.7^{-8}
Airblast Application - grapes, blueberries, brambles, dwarf stock (V)	0.697 - 1.40	1.0^{-2} - 2.0^{-2}	8.2^{-5} - 1.6^{-4}	4.1^{-5} - 8.2^{-5}	4.9^{-8} - 9.9^{-8}
Airblast Application - Standard Orchard - apples, apricots, cherries, peach, nectarines (VI)	0.404 - 0.797	5.8^{-3} - 1.1^{-2}	4.7^{-5} - 9.4^{-5}	2.4^{-5} - 4.7^{-5}	2.9^{-8} - 5.6^{-8}
Groundboom Application - strawberries and ornamentals (VII)	0.06	8.6^{-4}	1.6^{-5}	8.2^{-6}	9.0^{-9}
Groundboom Application - Golf Courses - VII)	0.179	2.6^{-3}	7.0^{-5}	3.5^{-5}	4.2^{-8}
Paint Brush (VIII)	0.77	1.1^{-2}	4.5^{-4} (Home-owner 3.0^{-5})	2.3^{-4} (home-owner 2.8^{-5}	1.7^{-7} (Home-owner 1.6^{-8}
Paint-Airless Sprayer (IX)	5.09 (with a dust/mist respirator)	7.3^{-2}	3.0^{-3} (Home-owner 2.0^{-4})	1.5^{-3} (Home-owner 1.4^{-4})	1.8^{-6} (Home-owner 1.7^{-7})
High Pressure Spray (X)	0.112	1.6^{-3}	1.1^{-4}	5.7^{-5}	6.8^{-8}

Table 10. Cancer Risk for Mixer/Loader/Applicators Using Captan

Mixer/Loader Scenario From the PHED Surrogate Table 3	**DSD mg/day** From the PHED Surrogate Exposure Table 3	**DDE mg/kg/da** Adjusted for Body Weight (70 kg)	AADE x 10	LADE x 10	Risk x 10
Low Pressure Handwand Using a Wettable Powder (XI) 18x/yr, 50 years	0.065	9.3^{-4}	4.6^{-5}	3.3^{-5}	3.9^{-8}
Low Pressure Handwand Using a Liquid Flowable (XII) 10x/yr	0.003	4.3^{-5}	1.2^{-6}	5.9^{-7}	7.1^{-10}
Backpack/ Knapsack (XIII) 26x/yr	0.1 - 0.4	1.4^{-3} - 5.7^{-3}	1.0^{-4} - 4.1^{-4}	5.1^{-5} - 2.0^{-4}	6.1^{-8} - 2.4^{-7}
Garden Hose-end Sprayer (homeowner) (XIV) 10x/50 yrs	0.468	6.7^{-3}	1.8^{-4}	1.3^{-4}	1.6^{-7}
Hose-end Sprayer (commercial lawn care operator) (XV) 10x/yr	6.527	9.3^{-2}	2.6^{-3}	1.8^{-4}	2.2^{-7}

Non-Agricultural Uses:

Use in cosmetics, hand soaps, and pet powders/shampoos.

Exposure to persons using captan-containing cosmetics, hand soaps, and pet products was addressed in the PD 2/3. In that document, exposure was considered negligible. Although there are no new data, these scenarios will be addressed by assuming an individual is exposed to the above mentioned products containing 0.1 to 0.5% captan. For both shampoos and make-up containing captan, a rough estimate of exposure can be made as follows:

200 mg/use x 0.1 - 0.5% captan x 0.4%/hr dermal absorption =

= 0.0008 - 0.004 mg/hour

For pet powders/shampoos, one hour of exposure is assumed. Therefore, daily exposure is estimated to be 1.3 to 6.7 x 10^{-5} mg/kg/day (60 kg body weight). Cancer risk for exposure once per week is estimated to be 1.0 - 5.0 x 10^{-9}.

For make-up, 8 hours of exposure is assumed. Therefore, daily exposure is 7.0 x 10^{-5} - 3.5 x 10^{-4} (60 kg body weight). If the make-up was worn every day, cancer risk is assumed to be 4.2 x 10^{-8} - 2.1 x 10^{-7}. This would appear to be a upperbound estimate since the assessment does not factor in the potential binding that may occur with the other ingredients contained in the make-up matrix. This assessment also assumes daily use of a make-up containing captan. This would seem very unlikely. It should be noted that exposure, for people wearing cosmetics treated with captan, is addressed by the Food and Drug Administration.

Postapplication/Reentry Exposure (Workers):

Terrestrial Food Uses:

Seed Treatment for crops such as alfalfa, cereal grains, cotton, soybeans, corn, potatoes, and vegetables.

There are no post-application data available for EPA to directly assess the risks for this scenario. However, the potential for postapplication exposure following the seed treatment uses is likely to be lower than the post-application exposure to foliage of treated strawberries. Therefore, the post-application exposure/risk assessment for strawberries will be used as a reasonable worse-case surrogate for this scenario.

Spray Applications to almonds, apples, apricots, blueberries, cherries, grapes, pears, plums, strawberries, caneberries (IR-4), nectarines, and peaches.

To estimate post-application/reentry exposure for workers entering crops treated with captan the Captan Task Force submitted four exposure studies represented by MRID numbers 409886-01,2 (strawberries), 4008239-02, (apples), 409886-03, 409856-01 (grapes), and 409886-04, 409665-01 (peach). A study was also conducted on tomatoes. However, since the Captan Task Force is not supporting tomatoes, the study was not used in this assessment.

strawberries

In the strawberry study, strawberries were treated with 8 applications of 3 pounds active ingredient per acre. Worker exposure monitoring was conducted on strawberry pickers. Several studies were also conducted by EPA for the Department of Labor. Table 11 presents estimated strawberry reentry worker exposure using selected results submitted by the Captan Task Force and EPA funded studies. These results include dislodgeable foliar residue (DFR) data, transfer factors (cm^2/hr), days after treatment (DAT) and daily exposures (mg/day). Workers are assumed to work 8 hour days.

TABLE 11
Post-Application Exposure Following Captan Applications to Strawberries

Study	Application rate/# of applications	Days After Treatment	DFR $\mu g/cm^2$	Transfer Factor cm^2/hr	Daily Dose mg/day
Captan Task Force	3lb ai/8X	0 (after sprays dried)	11.59	1300*	2.15
"	"	1	8.99	"	1.66
"	"	2	7.82	"	1.45
"	"	3	8.3	"	1.54
"	"	4	6.04	"	1.12
"	"	14	3.3	"	0.6
"	"	0	12.1***	1500**	2.58

* The transfer factor represents a worker wearing short-sleeved shirts and long pants. A penetration factor of 15% was estimated based on measurements inside a single layer of clothing worn by workers in the Captan Task Force study. The above DFR's from the Captan Task Force data include THPI residues for use in the acute risk assessment.

** The transfer factor represents individuals wearing short-sleeved shirts and short pants. A penetration factor of 15% was estimated based on measurements inside a single layer of clothing worn by workers in the Captan Task Force study.

***+ This is the highest measured residue taken from the Captan Task Force study.

++ DFRs reported as 2 and 13 days post application in separate publications. See References 5 and 7 respectively.

TABLE 12
Post-Application Acute Risks Following Captan Applications to Strawberries

Study	Daily Dose (DD) (mg/day)	Days After Treatment	Daily Exposure (Corrected for body wt. 60Kg)	Margin of Exposure
Captan Task Force	2.15	0 (after sprays dried)	0.036	278
"	1.66	1	0.028	357
"	1.45	2	0.024	417
"	1.54	3	0.026	385
"	1.12	4	0.019	526
"	0.6	14	0.01	1000
"	2.58	0	0.043***	233

Table 13 presents average annual daily exposures (AADE), lifetime average daily exposure (LADE), and Risk for harvesters. For these calculations, OREB assumed 80 and 120 days for the AADE, 35/70 years for the LADE, and the Q^* 1.21 x 10^{-3} for calculating risk. OREB has assumed 120 days per year exposure in California and 80 days per year for the rest of the country. The daily dose is derived from the Captan Task Force DFR data do not include residues of THPI. The assumption of 80 to 120 days of exposure to 24 hour post application residues is assumed to be unrealistic. The risks presented should be viewed as a worst case scenario as they do not address percent crop treated or typical rates. Risks are assumed to be much lower.

TABLE 13
Post-Application Cancer Risks Following Captan Applications to Strawberries

Study	Daily Dose (DD) (mg/day)	Daily Dose (Corrected for body wt.70 Kg) (mg/kg/da)	Amortized Average Daily Exposure (mg/kg/day) x 10 (80 - 120 days/year)	Lifetime Average Daily Exposure Dose (mg/kg/day) x 10	Risk (mg/kg/day) x 10
Captan Task Force	2.04	0.029	6.4^{-3} - 9.6^{-3}	3.2^{-3} - 4.8^{-3}	3.9^{-6} - 5.8^{-6}
"	1.54	0.022	4.8^{-3} - 7.2^{-3}	2.4^{-3} - 3.6^{-3}	2.9^{-6} - 4.4^{-6}
"	1.2	0.017	3.7^{-3} - 5.6^{-3}	1.9^{-3} - 2.8^{-3}	2.3^{-6} - 3.4^{-6}
"	1.5	0.021	4.6^{-3} - 6.9^{-3}	2.3^{-3} - 3.5^{-3}	2.7^{-6} - 4.2^{-6}
"	1.06	0.015	3.3^{-3} - 4.9^{-3}	1.6^{-3} - 2.5^{-3}	1.9^{-6} - 3.0^{-6}
"	0.6	0.009	2.0^{-3} - 3.0^{-3}	9.9^{-4} - 1.5^{-3}	1.2^{-6} - 1.8^{-6}
	2.58	0.037***	8.1^{-3} - 1.2^{-2}	4.1^{-3} - 6.1^{-3}	4.9^{-6} - 7.4^{-6}

*** This is the highest measured residue taken from the Captan Task Force study.

grapes

In the grape study, 6 applications were applied to grapes at a rate of 3 pounds active ingredient per acre. Two sets of applications were made; 3 from 4/25 to 5/26 and 3 from 8/11 to 8/25. Workers were monitored while harvesting raisin grapes. A transfer factor of 4700 cm^2/hour was calculated using an estimated penetration factor for workers wearing short-sleeved shirts and long pants. Dosimeters were located inside and outside of a single layer of clothing (coveralls). The Captan Task Force is supporting a 2 pound active ingredient rate per acre. Therefore, the residues were adjusted to reflect this reduced rate. Daily Systemic Dose (DSD) for workers harvesting, leaf pulling, cluster thinning are presented in Table 12. Workers are assumed to work 8 hour days.

peach

In the peach study, one dormant and 7 cover sprays were made to peaches. A transfer factor of 1600 cm^2/hour was calculated using an estimated penetration factor for workers wearing short-sleeved shirts and long pants. Dosimeters were located inside and outside of a single layer of clothing (coveralls). The maximum number of applications were made to peach orchards located in California. This scenario is assumed to be worst case for all other tree fruit crops since it is has the highest rate (4lb ai/acre).

TABLE 14

Post-Application Exposures Following Captan Applications to Grapes and Peaches

CROP	Days After Treatment	DFR $\mu g/cm^2$*	Transfer Factor cm^2/hr	Daily Dose mg/day
Grapes	0 (after sprays dried)	15.67	4700	10.49
	1	16.7	4700	11.18
	2	13.98	4700	9.56
	5	5.17	4700	3.46
	14	2.09	4700	1.39
Peach	0 (after sprays dried)**	25.46	1600	5.80
Peach	1**	25.06	1600	5.79
	2**	24.66	1600	5.62

* Includes THPI

** Calculated from semilog regression analysis

TABLE 15
Post-Application Acute Risks Following Captan Applications to Grapes and Peaches

Crop	Daily Dose (DE) (mg/day)	Days After Treatment	Daily Dose (Corrected for body wt. 60Kg)	Margin of Exposure
Grapes	10.49	0 (after sprays have dried)	0.175	57
"	11.18	1	0.186	54
"	9.56	2	0.159	63
"	3.46	5	0.058	172
"	1.39	14	0.023	435
Peach	5.80	0 (after sprays have dried)	0.097	103
"	5.79	1	0.097	103
"	5.62	2	0.094	106

TABLE 16
Post-Application Cancer Risks Following Captan Applications to Grapes and Peaches

Crop	Daily Dose (DD) (mg/day)*	Daily Dose (Corrected for body wt.70 Kg) (mg/kg/da)	Amortized Average Daily Exposure (mg/kg/day) x 10 (Grapes 110 and other tree crops 60 days/year)	Lifetime Average Daily Exposure (mg/kg/day) x 10	Risk (mg/kg/day) x 10
Grapes	3.39	0.048	1.5^{-2}	7.4^{-3}	9.0^{-6}
"	1.39	0.02	6.0^{-3}	3.0^{-3}	3.6^{-6}
"Peach	5.67	0.081	1.3^{-2}	6.6^{-3}	8.0^{-6}
"	5.58	0.08	1.3^{-2}	6.6^{-3}	8.0^{-6}
"	5.49	0.078	1.3^{-2}	6.6^{-3}	8.0^{-6}

* Does not include THPI

Terrestrial Non-Food Uses:

Spray Applications to azaleas, begonias, camellias, carnations, chrysanthemums, conifers, dichondra, gladiolus, grasses (lawns and lawn seedbeds), ornamental flowering plants, roses.

To calculate risk for workers harvesting and bundling flowers, EPA used dislodgeable foliar residue (DFR) data from the Task Force's Strawberry DFR study (MRID 409886-01) and transfer coefficients developed in the Netherlands (Brouwer et al.)[2]. The strawberry data were chosen due to the similarity of the application rate. The transfer coefficients suggested by Brouwer et al. is 7,000 cm^2. Workers are assumed to cut flowers 3 to 6 hours per day.

There are no appropriate data available to address reentry to home lawns following applications of captan. Therefore, EPA roughly estimated the probable exposure by assuming an application rate of 4 lb ai/acre, residues of 6.5$\mu g/cm^2$ (1.3 $\mu g/cm^2$ by day 7), a transfer factor of 10,000 cm^2/hour (with 4 hours of exposure), a 15 kg body weight, and 10 years of exposure. Cancer was the only adverse effect addressed in this exposure assessment. OREB is not certain that the developmental effects observed in the animal studies, which occurred in utero, apply to children. The Captan Task Force Members are also members of the Outdoor Residential Task Force which is addressing dermal exposure to pesticides applied to residential turf. OREB recommends revisiting this scenario once those data are available. The registrant is required to generate dislodgeable foliar residue data for this use.

TABLE 17
Post-Application Exposures Following Captan Applications to Ornamentals and Turf

CROP	Days After Treatment	DFR $\mu g/cm^2$	Transfer Factor cm^2/hr	Daily Dose mg/day
Ornamental crops such as chrysanthemums **	1	8.99	7000	1.52 - 8.32
"	2	8.37	7000	1.42 - 7.74
"	3	7.79	7000	1.32 - 7.2
"	5	6.74	7000	1.14 - 6.24
"	14	3.58	7000	0.607 - 3.279
Turfgrass Residence	0 (after sprays have dried)	6.50	10000	2.58
"	7	1.3	10000	0.516

** Calculated from the semilog regression of the strawberry DFR data.

TABLE 18
Post-Application Acute Risks Following Captan Applications to Ornamentals

Crop	Daily Dose (DD) (mg/day)	Days After Treatment	Daily Dose (Corrected for body wt. 60Kg)	Margin of Exposure
Ornamental crops such as chrysanthemums	1.52 - 8.32	1	0.025 - 0.139	72 - 400
"	1.42 - 7.74	2	0.024 - 0.128	78 - 417
"	1.32 - 7.2	3	0.022 - 0.12	83 - 455
"	1.14 - 6.24	5	0.019 - 0.104	96 - 526
"	0.61 - 3.28	14	0.01 - 0.055	181 - 1000

TABLE 19
Post-Application Cancer Risks Following Captan Applications to Ornamentals

Crop	Daily Dose (DD) (mg/day)	Daily Dose (Corrected for body wt.70 Kg) (mg/kg/da)	Amortized Average Daily Exposure (mg/kg/day) x 10 (Ornamental - 180 days/year)	Lifetime Average Daily Exposure (mg/kg/day) x 10	Risk (mg/kg/day) x 10
Greenhouse Ornamental crops such as chrysanthemum	1.14 - 6.24	1.63^{-2} - 8.9^{-2}	8.0^{-3} - 4.4^{-2}	4.0^{-3} - 2.2^{-2}	4.8^{-6} - 2.6^{-5}
"	0.61 - 3.28	8.7^{-3} - 4.7^{-2}	4.3^{-3} - 2.3^{-2}	2.1^{-3} - 1.2^{-2}	2.5^{-6} - 1.4^{-5}

TABLE 20
Post-Application Cancer Risks Following Captan Applications to Residential Turf

Crop	Daily Dose (DD) (mg/day)	Daily Dose (Corrected for body wt. 15 Kg) (mg/kg/da)	Amortized Average Daily Exposure (mg/kg/day) x 10 (10 days/year)	Lifetime Average Daily Exposure (mg/kg/day) x 10 10 years	Risk (mg/kg/day) x 10
Turfgrass - Residence	2.58	0.172	4.7^{-3}	6.7^{-4}	8.1^{-7}
"	0.52	0.035	9.5^{-4}	1.4^{-4}	1.7^{-7}

Restricted Entry Interval (REI):

The Agency and the regulated community has not developed a model to assess or a method to quantify post-application worker exposure to eye irritants. To mitigate reentry worker risk from eye irritants, the Agency currently imposes, through, the Worker Protection Standard for Agricultural Pesticides, an interim restricted-entry interval of 48-hours for active ingredients classified as toxicity category I for eye irritation potential. Some of the reentry incidents noted in the Illness Survey occurred 5 to 8 days after the pesticides were applied. Grower groups contend that REI's longer than 12 hours can be overly burdensome for fruit and cut-flower producers, because fruit and flowers ripen continuously throughout the harvest season and therefore must either be picked un-ripe before a pesticide application or over-ripe if harvest is delayed. EPA is concerned about the potential eye irritation effects resulting from post-application exposures to captan and will impose requirements, including eyeflush container availability and notification to workers about the eye irritation potential.

IV. REFERENCES:

1. Letter from M.E. Rhodes, Captan Task Force Chairman, to Peg Perreault, EPA/SRRD dated May 11, 1994.

2. Brouwer et al., Pesticides in the Cultivation of Chrysanthemums in Greenhouses: Part I, and Pesticides in the Cultivation of Carnations in Greenhouses: Part II, American Industrial Hygiene Association Journal, September 1992.

3. California Department of Food and Agriculture, Worker Health and Safety Branch, Human Exposure Assessment, Third Revision, January 5, 1990.

4. Letter from J. Evans, EPA/OREB to P. Perreault, EPA/SRRD dated March 14, 1994, Re: Revised Captan REI for Strawberries.

5. Popendorf et al, Youth in Agriculture, Pesticide Exposure to Strawberry Pickers, Office of Pesticide Programs, EPA, Washington, D.C., 1983.

6. Zweig et al., Simultaneous Dermal Exposure to Captan and Benomyl by Strawberry Harvesters, J. Agric. Food Chem., 1983.

7. Zwieg et al., The Relationship Between Dermal Pesticide Exposure by Fruit Harvesters and Dislodgeable Residues, J. Environ. Sci. Health, 27 - 59, 1985.

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(SECTION IV - REGULATORY POSITION AND LABELING RATIONALE)

OCCUPATIONAL AND RESIDENTIAL LABELING RATIONALE/RISK MITIGATION

At this time, some products containing captan are intended primarily for occupational use and some are intended primarily for homeowner use.

The Worker Protection Standard (WPS)

EPA's Worker Protection Standard for Agricultural Pesticides (WPS) affects all pesticide products whose labeling reasonably permits use in the commercial or research production of agricultural plants on any farm, forest, nursery, or greenhouse. In general, WPS products had to bear WPS-complying labeling when sold or distributed after April 21, 1994. The WPS labeling requirements pertaining to personal protective equipment (PPE), restricted-entry intervals (REI), and notification are interim. These requirements are to be reviewed and revised, as appropriate, during reregistration and other Agency review processes.

At this time some of the registered uses of captan are within the scope of the WPS and some uses are outside the WPS scope.

Requirements for Handlers

For each end-use product, personal protective equipment and engineering control requirements for pesticide handlers are set during reregistration as follows:

- *Based on risks posed to handlers by the active ingredient, EPA may establish active-ingredient-specific (a-i specific) handler requirements for end-use products containing that active ingredient. If such risks are minimal, EPA may choose not to establish a-i-specific handler requirements.*

- *EPA establishes handler PPE requirements for most end-use products, based on each product's acute toxicity characteristics.*

- *If a-i-specific requirements have been established, they must be compared to the end-use-product-specific PPE. The more stringent choice for each type of PPE (i.e., bodywear, hand protection, footwear, eyewear, etc.) must be placed on the label of the end-use product. Engineering controls are considered more stringent than PPE requirements.*

Occupational-Use Products

EPA is establishing a-i-specific requirements for some occupational handlers for captan. Captan is classified as a Group B_2 carcinogen and has a toxicological endpoint of concern for short-term exposures due to possible developmental effects.
The risk assessment for occupational handlers indicates that MOE's and cancer risks for dermal and inhalation exposure were a problem at baseline attire in many handling scenarios. EPA is requiring active-ingredient-based protections for handlers of captan in all these exposure situations.

Risks were acceptable, in most instances, for occupational mixers/loaders of wettable powder formulations when chemical-resistant gloves and a dust/mist respirator were used in addition to baseline attire. (The MOE for loading the hopper for seed piece treatment would be 250 with the addition of a dust/mist respirator.) The risks for mixer/loaders of wettable powder formulations to support aerial applications are unacceptable (50) even with the addition of chemical-resistant gloves and a respirator. However, EPA is persuaded that risks would be acceptable for such mixers and loaders if chemical-resistant aprons were also required. EPA has no specific data upon which to estimate the reduction in exposure to mixers and loaders with the addition of a chemical-resistant apron, however, the Agency believes that the reduction would adequately mitigate the risks. In addition, EPA notes that 100 percent inhalation absorption was assumed in the exposure/risk assessment. Inhalation absorption is likely to be in the range of 50%, which would result in an MOE of 77 even before a chemical-resistant apron are added.

Risks were acceptable for occupational mixers/loaders of liquid formulations only when chemical-resistant gloves were added to baseline attire.

Risks for applicators using motor-driven ground application equipment were acceptable at baseline attire. Risks for applicators using aerial equipment were also acceptable at baseline. The Pesticide Handlers Exposure Database (ver1.1) does not contain sufficient data to estimate exposure to applicators using aircraft with open cockpits. Therefore, the exposure and risk assessment for aerial applicators was estimated using enclosed cockpits. Although the vast majority of aerial applicators use aircraft with enclosed cockpits, EPA does not have concerns for handlers who may apply captan using aircraft with open cockpits, since the MOEs for enclosed cockpits are in the thousands.

Risks for applicators using handheld application equipment were acceptable with the addition of chemical-resistant gloves to baseline attire. Likewise, the risks to persons handling recently treated commodities, such as soil, seed, seed pieces, harvested fruit and nuts, and ornamental cuttings and transplants are acceptable only with the addition of chemical-resistant gloves to baseline attire. EPA notes that the MOE for professional lawn care operators is slightly less than 100 (93). However, EPA is not imposing additional PPE at this time for the following reasons. First, the PHED data for that scenario are limited and additional data are being collected for the scenario through the Outdoor Residential Exposure Task Force. The risks for this scenario will be reassessed when the additional data are

available. Secondly, the risks for these handlers will be further reduced by EPA's requirement that they wear dust/mist respirators while performing mixing/loading activities, although EPA has no specific data upon which to estimate the extent of the reduction in exposure. Finally, the risk assessment assumes 100% inhalation absorption, whereas inhalation absorption is likely to be in the range of 50%.

EPA has no data upon which to assess the risks to handlers placing commodities into or removing them from captan dipping solutions by hand. However, EPA believes the exposures would be potentially higher than those to persons handling recently treated commodities. Therefore, EPA is requiring persons participating in hand dipping operations to wear a chemical-resistant apron and chemical-resistant gloves in addition to baseline attire.

The risks in industrial settings to handlers adding captan as a preservative/fungicide to products (including paints, plastics, vinyl, rubber, adhesives, and cosmetics) are similar to the risks to mixers/loaders in agricultural situations. Therefore, chemical-resistant gloves will be required for such handlers. In addition, a dust/mist respirator will be required when wettable powder formulations are handled.

The occupational risks from handling (or using) most products where captan is added in the manufacturing processes is low due to the low anticipated exposure. A reasonable worse-case scenario representing these exposures is the exposures to occupational wallpaper hangers and occupational painters to wallpaper paste and paint respectively. The risks were acceptable to such handlers at baseline attire when applying the paste/paint with a brush. However, risks to occupational painters applying captan-containing paint with a sprayer are acceptable only when a dust/mist respirator is added to baseline attire. EPA has no direct regulatory authority over most such paint when the paint label does not claim pesticidal properties. Therefore, EPA is requiring on the labels of captan products with directions for use as a paint additive, directions that captan treated paint carry a requirement for a dust/mist respirator for painters applying the paint with a sprayer.

EPA is concerned about the eye irritation potential of captan, since it is classified as a severe irritant and there are reports of incidents from California. However, rather than establishing a.i.-specific protective eyewear requirements, EPA will require protective eyewear for handlers when the end-use product is classified as toxicity category I or II for eye irritation potential.

WPS and NonWPS uses:

Since potential handler exposure is similar for WPS and nonWPS uses, the a-i-specific handler requirements (specified in Section V) do not differentiate between WPS and nonWPS occupational uses of captan end-use products.

Homeowner-Use Products

EPA is not establishing a-i-specific requirements for homeowner handlers for captan. The risk assessments for homeowner exposures using a garden hose-end sprayer for lawn and garden treatments, applying captan-containing paint or wallpaper paste, or using captan-containing pet products, hand soaps, and cosmetics are acceptable even assuming that no protective attire is worn.

EPA is establishing a-i-specific PPE recommendations for some homeowner handlers for captan. EPA believes that prudent safety practices indicates that homeowners should wear long-sleeve shirts, long pants, shoes, and socks while applying captan as a spray. In addition, the potential for severe eye irritation warrants a recommendation for the use of protective eyewear, such as shielded safety glasses, when applying captan as a spray.

Post-Application/Entry Restrictions

Occupational-Use Products (WPS Uses)

Restricted-entry intervals, early-entry PPE, and "double" notification:

The interim Worker Protection Standard (WPS) restricted-entry intervals (REIs) for agricultural workers are based solely on the acute dermal toxicity and skin and eye irritation potential of the active ingredient. In addition, the WPS retains two types of REI's established by the Agency before the promulgation of the WPS: (1) product-specific REI's established on the basis of adequate data, and (2) interim REI's that are longer than those that would be established under the WPS.

The WPS prohibits routine entry to perform hand labor tasks during the REI and requires PPE to be worn for other early-entry tasks that require contact with treated surfaces.

"Double" notification is the statement on the labels of some WPS pesticide products requiring employers to notify workers about pesticide-treated areas orally as well as by posting of the treated areas. The interim WPS "double" notification requirement was imposed if the active ingredient is classified as toxicity category I for acute dermal toxicity or skin irritation potential.

During the reregistration process, EPA establishes REI's, early-entry PPE, and double notification requirements based on consideration of all available relevant information about the active ingredient, including acute toxicity, other adverse effects, epidemiological information, and post-application data.

EPA is establishing a 12-hour restricted-entry interval for all crops and use-sites (e.g., soil-directed applications) except for grapes and ornamental crops. The exposure/risk assessments indicate that risks from post-application exposures to most crops should be acceptable if routine entry is delayed for 12 hours after application.

EPA is establishing a 5-day restricted-entry interval for grapes and ornamental crops. The assessments indicate that risks from post-application exposures to these crops should be acceptable if routine entry is delayed for 5 days after application. Data indicate reentry workers' contact with treated surfaces of these crops is likely to result in significantly higher exposure than for other captan-treated crops. The Agency notes that, at this time, EPA has granted to the rose industry an exception to the WPS prohibition on routine entry to perform harvesting and other hand-labor tasks. That exception, among other provisions, limits entry by workers to perform hand labor tasks in roses to three hours per worker per day. The post-application exposure/risk assessment for captan on ornamentals indicates that, after at least twelve hours following application, post-application risks would be acceptable provided workers were limited to three hours or less exposure per day. Therefore, EPA will continue to allow the WPS exception that permits early entry by workers to perform hand labor tasks on roses to apply roses to which captan has been applied.

The following is the early-entry PPE required for all in-scope WPS uses of products containing captan: coveralls, shoes, socks, chemical-resistant gloves, and protective eyewear. EPA has determined that double notification is not required. Protective eyewear is required because captan is classified as toxicity category I for eye irritation potential.

In addition to the entry restrictions discussed above, EPA is establishing additional post-application requirements due to eye irritation concerns. Under the Worker Protection Standard, a 48-hour restricted-entry interval would be established for captan, since the active ingredient is classified as toxicity category I for eye irritation potential. During the reregistration evaluation, the Agency considered whether to impose a 48-hour REI due to eye irritation concerns. However, by the end of the 48-hour interval, the residues from captan would not necessarily have dissipated to a level where eye irritation is no longer a concern. Depending on plant growth, rainfall, and the timing and type of irrigation, residues of eye irritation concern might exist for seven days or more following application. In several studies, it was noted that the residues of captan did not dissipate appreciably over the time of the study. Due to the uncertainties in determining a set time interval when eye irritation from residues are no longer a concern and the economic urgency for the use captan at a time that coincides with necessary hand-labor tasks, such as harvesting, the Agency sought an alternative to a 48-hour (or other length) REI as a means of adequately mitigating eye irritation concerns. To mitigate eye irritation concerns from post-application exposures, the Agency is requiring that, for at least seven days following the application of captan:

- at least one container designed specifically for flushing eyes is available in operating condition at the WPS-required decontamination site for workers entering the area treated with captan, and

- workers are informed orally, in a manner they can understand:
  -- that residues in the treated area may be highly irritating to their eyes,
  --that they should take precautions, such as refraining from rubbing their eyes, to keep the residues out of their eyes.

-- that if they do get residues in their eyes, they should immediately flush their eyes with the eyeflush container that is located at the decontamination site, and
-- how to operate the eyeflush container.

At this time, captan is not a candidate for a 4-hour REI, since it is classified as a probable human carcinogen (group B2), and there are short-term dermal endpoints of concern.

Occupational-Use Products (NonWPS Uses)

Since EPA has concerns about post-application exposures to persons after nonWPS occupational uses of captan to ornamentals plants and turfgrass, it is establishing entry restrictions for those nonWPS occupational uses of captan. The Agency has determined that restricting entry into treated areas after liquid applications until sprays have dried and after dry applications until dusts have settled is a prudent safety practice applicable in settings, such as golf-course sites, landscape plantings, and other locations where captan is applied to plants as a spray or dust.

EPA is not establishing entry restrictions at this time for nonWPS occupational uses of captan including use of captan-containing paint and wallpaper paste, pet products, and hand soaps, cosmetics. The anticipated frequency, duration, and degree of exposure following nonWPS occupational applications and uses involving these products do not warrant special risk mitigation measures.

Homeowner-Use Products

Since EPA has concerns about post-application exposures to homeowners following application of captan to ornamentals plants and turfgrass at residential sites, it is establishing entry restrictions for uses of captan at residential sites. The Agency has determined that restricting entry into treated areas after liquid applications until sprays have dried and after dry applications until dusts have settled is a prudent safety practice applicable in residential settings when captan is applied to plants as a spray or dust.

EPA is not establishing entry restrictions at this time for uses of captan at residential sites, including use of captan-containing paint and wallpaper paste, pet products, hand soaps, and cosmetics. The anticipated frequency, duration, and degree of exposure following such applications and uses at residential sites do not warrant special risk mitigation measures.

Other Labeling Requirements

The Agency is also requiring other use and safety information to be placed on the labeling of all end-use products containing captan. For the specific labeling statements, refer to Section V of this document.

(RED SECTION V - LABELING REQUIREMENTS)

LABELING REQUIREMENTS FOR END-USE PRODUCTS

The labels and labeling of all products must comply with EPA's current regulations and requirements as specified in 40 CFR 156.10 and other applicable notices. All end-use product labels [e.g. multiple active ingredient (MAI) labels, SLN's, and products subject to generic data exemption] must be amended such that they are consistent with the basic producer labels. See Appendix A for appropriate rates and restrictions for those supported uses.

OCCUPATIONAL/HOMEOWNER PROTECTION

PPE/Engineering Control Requirements for Pesticide Handlers

For **sole-active-ingredient** end-use products that contain captan, the product labeling must be revised to adopt the handler personal protective equipment and/or engineering control requirements set forth in this section. Any conflicting PPE requirements on the current labeling must be removed.

For **multiple-active-ingredient** end-use products that contain captan, the handler personal protective equipment and/or engineering control requirements set forth in this section must be compared to the requirements on the current labeling and the more protective must be retained. For guidance on which requirements are considered more protective, see PR Notice 93-7.

Products Intended Primarily for Occupational Use

Active-Ingredient-Specific PPE or Engineering Control Requirements

EPA is not establishing active-ingredient-specific engineering controls for any occupational uses of captan end-use products.

EPA is establishing active-ingredient-specific PPE for some occupational uses of captan end-use products.

For wettable powder and dust formulations:

"Applicators and other handlers (other than mixers and loaders) must wear:
--long-sleeved shirt and long pants and
--shoes plus socks.

Chemical-resistant gloves* are also required when using hand-held application equipment and when handling recently treated commodities, such as soil, seed, seed pieces, harvested fruit and nuts, and ornamental cuttings and transplants.

A chemical-resistant apron and chemical-resistant gloves* are also required for handlers placing commodities into or removing them from captan dipping solutions by hand.

Mixers and loaders must wear:
--long-sleeved shirt and long pants,
--shoes plus socks,
--chemical-resistant gloves*,
--a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C).
If mixing and loading to support aerial application, a chemical-resistant apron is also required."

For liquid formulations:

"Applicators and other handlers must wear:
--long-sleeve shirt and long pants,
--shoes plus socks.
Chemical-resistant gloves* are also required (1) WHEN mixing and loading, (2) when using hand-held application equipment and (3) when handling just treated commodities, such as soil, seed, seed pieces, harvested fruit and nuts, and ornamental cuttings and transplants.

A chemical-resistant apron and chemical-resistant gloves* are also required for handlers placing commodities into or removing them from captan dipping solutions by hand.

* For the glove statement, use the statement established for captan through the instructions in Supplement Three of PR Notice 93-7.

For formulations that contain directions for use as a paint additive:

Place on the labeling near the beginning of the use directions for paint additives, the following statement:

"When this product is used as a paint additive, the label on each paint container must state that painters must use a dust/mist respirator when applying the paint with a spray equipment."

Determining PPE Requirements for End-use Product Labels

The PPE that would be established on the basis of the acute toxicity category of the end-use product must be compared to the active-ingredient-specific personal protective equipment specified above. The more protective PPE must be placed on the product labeling. For guidance on which PPE is considered more protective, see PR Notice 93-7.

Placement in Labeling

The personal protective equipment requirements must be placed on the end-use product labeling in the location specified in PR Notice 93-7, and the format and language of the PPE requirements must be the same as is specified in PR Notice 93-7.

Products Intended Primarily for Homeowner Use

Minimum (baseline) PPE Requirements

The PPE recommended for captan end-use products that are intended primarily for homeowner use for use as a spray on garden plants or lawns is:

> "Users should wear a long-sleeve shirt, long pants, shoes, and socks when using this product. In addition, users should wear protective eyewear, such as shielded safety glasses, because this product is a severe eye irritant."

Determining PPE Requirements for End-Use Product Labels

The PPE, if any, that would be established on the basis of the acute toxicity category of each end-use product must be compared to the active-ingredient-specific personal protective equipment specified above. The more protective PPE must be placed on the product labeling. A requirement is considered more protective than a recommendation (e.g., "must wear" is more protective than "should wear"). For guidance on which PPE is considered more protective, see PR Notice 93-7.

Placement in Labeling

The personal protective equipment requirements and recommendations must be placed on the end-use product labeling immediately following the precautionary statements in the labeling section "Hazards to Humans (and domestic animals)."

Entry Restrictions

For **sole-active-ingredient** end-use products that contain captan, the product labeling must be revised to adopt the entry restrictions set forth in this section. Any conflicting entry restrictions on the current labeling must be removed.

For **multiple-active-ingredient** end-use products that contain captan the entry restrictions set forth in this section must be compared to the entry restrictions on the current labeling and the more protective must be retained. A specific time period in hours or days is considered more protective than "sprays have dried" or "dusts have settled."

Products Intended Primarily for Occupational Use

WPS Uses

Restricted-entry interval:

A 5-day REI is required for grapes and ornamental plants, including turf grown for sod. A 12-hour restricted-entry interval (REI) is required for all other crops.

"Exception: if the product is soil-injected or soil-incorporated, the Worker Protection Standard, under certain circumstances, allows workers to enter the treated area if there will be no contact with anything that has been treated."

Early-entry personal protective equipment (PPE):

The PPE required for early entry is:
-- coveralls,
-- chemical-resistant gloves,
-- shoes plus socks, and
-- protective eyewear.

Eye Irritation Warnings:

The following statements must be placed on the labeling of every captan end-use product that contains directions for WPS uses.

"**Special Eye Irritation Provisions:** This product is a severe eye irritant. Do not enter or allow workers to enter a treated area within 7 days of application, unless the following safety measures have been taken:

(1) At least one container designed specifically for flushing eyes must be available in operating condition at the WPS-required decontamination site intended for workers entering the treated area.
(2) Workers must be informed, in a manner they can understand:
-- that residues in the treated area may be highly irritating to their eyes,
--that they should take precautions, such as refraining from rubbing their eyes, to keep the residues out of their eyes,
-- that if they do get residues in their eyes, they should immediately flush their eyes using the eyeflush container that is located at the decontamination site or using other readily available clean water, and
-- how to operate the eyeflush container.

Placement in labeling:

The REI must be inserted into the standardized REI statement required by Supplement Three of PR Notice 93-7.

The PPE required for early entry must be inserted into the standardized early-entry PPE statement required by Supplement Three of PR Notice 93-7.

The double notification statement must be placed into the Agricultural Use Requirements box as required by Supplement Three of PR Notice 93-7.

NonWPS uses

Entry restrictions:

The Agency is establishing the following entry restrictions for nonWPS occupational uses of captan end-use products:

For liquid applications for use on plants, including ornamentals and turfgrass: "Do not enter or allow others to enter the treated area until sprays have dried."

For dry applications for use on plants, including ornamentals and turfgrass: "Do not enter or allow others to enter the treated area until dusts have settled."

Placement in labeling:

If WPS uses are also on label -- Follow the instructions in PR Notice 93-7 for establishing a Non-Agricultural Use Requirements box, and place the appropriate nonWPS entry restrictions in that box.

If no WPS uses are on the label -- Place the appropriate nonWPS entry restrictions in the Directions for Use, under the heading "Entry Restrictions."

Products Intended Primarily for Homeowner Use

Entry restrictions:

The Agency is establishing the following entry restrictions for all homeowner uses of captan end-use products: _

For liquid (spray) applications for use on plants, including gardens, houseplants, and lawns:

"Do not allow people or pets to touch treated plants until the sprays have dried."

For dry applications on plants, including gardens, houseplants, and lawns:

"Do not allow people or pets to enter the treated area until dusts have settled."

Placement in labeling: Place the appropriate entry restrictions in the Directions for Use, under the heading "Entry Restrictions."

Other Labeling Requirements

Products Intended Primarily for Occupational Use

The Agency is requiring the following labeling statements to be located on all end-use products containing captan that are intended primarily for occupational use.

Application Restrictions

Registrants: use the following statement on end-use products containing directions for use on plants or soil:

"Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application."

Registrants: use the following statement on end-use products containing directions for use in manufacturing or industrial settings as an additive or preservative:

"Do not use this product in a way that will contact workers or other persons."

Registrants: no application restriction is needed on products such as cosmetics or hand soaps.

Engineering Controls

Registrants: use the following statement on end-use products containing directions for use on plants or soil:

"When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6), the handler PPE requirements may be reduced or modified as specified in the WPS."

Registrants: no engineering control statement is needed on products containing directions for use in manufacturing or industrial settings as an additive or preservative) or on products such as cosmetics or hand soaps.

User Safety Requirements

"Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry."

User Safety Recommendations

- "Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet."
- "Users should remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing."
- "Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing."

Skin Sensitizer Statement

"This product may cause skin sensitization reactions in some people."

Products Intended Primarily for Home Use

Application Restrictions

Registrants: use the following statement on end-use products containing directions for use on plants or soil:

> "Do not apply this product in a way that will contact any person or pet, either directly or through drift. Keep people and pets out of the area during application."

Registrants: no application restriction is needed on products such as cosmetics, hand soaps, or pet products.

User Safety Recommendations

- "Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet."
- "Users should remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing."

Skin Sensitizer Statement

"This product may cause skin sensitization reactions in some people."

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13544

R138586

Chemical: Captan

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